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BLAKELY SOKOLOFF TAYLOR & ZAFMAN
1279 OAKMEAD PARKWAY
SUNNYVALE, CA 94085-4040

EXAMINER
TRAN, DENISE

ART UNIT	PAPER NUMBER
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

PTOL-90A (Rev. 04/07)

	Application No.	Applicant(s)
	10/621,745	WILKERSON, CHRISTOPHER B.
Office Action Summary	Examiner	Art Unit	
	Denise Tran	2185	

-- *The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE <u>3</u> MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
  Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *14 June 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *39,40,43-48,50-58,61-68,73 and 76-79* is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *39,40,43-48,50-58,61-68,73 and 76-79* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *16 July 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a)☐ All b)☐ Some * c)☐ None of:

      1.☐ Certified copies of the priority documents have been received.

      2.☐ Certified copies of the priority documents have been received in Application No. _____.

      3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1)☐ Notice of References Cited (PTO-892)
2)☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3)☐ Information Disclosure Statement(s) (PTO/SB/08)
    Paper No(s)/Mail Date _____.
4)☐ Interview Summary (PTO-413)
    Paper No(s)/Mail Date. _____.
5)☐ Notice of Informal Patent Application
6)☐ Other: _____.

DETAILED ACTION

1.   The applicant's response filed 6/14/07 has been considered. Claims 39-40, 43-

48, 50-58, 61-68, 73, 76 and new added claims 77-79 are presented for examination.

Claims 1-38, 41-42, 49, 59-60, 69-72, 74-75 have been canceled.

2.   The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that

form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3.   Claims 39, 44-47, 56-58, 67-68, 73, and 77-79 are rejected under 35

U.S.C. 102(b) as being anticipated by Wong et al., US 2002/0078061 A1 (hereinafter

Wong).

Claim 39, Wong teaches an apparatus comprising:

a cache to hold a first cache line (e.g., fig. 4, el. 407, 411; [0035]) and

a correlation prefetcher to prefetch to the cache a second cache line correlated

with the first cache line (e.g., [0018]; [0026]), wherein the correlation prefetcher is to

identify the second cache line as being correlated with the first cache line based on an

age of the second cache line relative to that of the first cache line (i.e., time or

reference; e.g., [0017], [0019]-[0022], [0026]).

Claim 58, Wong teaches a method comprising:

holding a first cache line in a cache (e.g., fig. 4, el. 407, 411; [0035]);

identifying a second cache line correlated with the first cache line based on an age of the second cache line relative to that of the first cache line (i.e., time or reference; e.g., [0017], [0019]-[0022], [0026]) (e.g., [0018]; [0026]); and

prefetching the second cache line to the cache (e.g., [0018]; [0026]).

Claim 73, Wong teaches a system comprising:

a processor including a cache to hold a first cache line (e.g., fig. 4, cache 407) and including a correlation prefetcher to prefetch to the cache a second cache line correlated with the first cache line (e.g., [0015]; [0035]) based on an age of the second cache line relative to that of the first cache line (i.e., time or reference; e.g., [0017], [0019]-[0022], [0026]) (e.g., [0018]; [0026]); and

memory coupled to said processor (e.g., fig. 4, els. 413, 400).

Claim 77, Wong teaches an apparatus comprising:

a cache to hold a first cache line (e.g., fig. 4, el. 407, 411; [0035]); and

a correlation prefetcher to prefetch to the cache a second cache line correlated with the first cache line (e.g., [0018]; [0026]), the correlation prefetcher is to identify the second cache line as being correlated with the first cache line based on how frequent the second cache line is loaded subsequent to the first cache line (i.e., other than most recently used; prefetch hits; e.g., [0026]) or [0022]).

Claim 78, Wong teaches a method comprising:

holding a first cache line in a cache (e.g., fig. 4, el. 407, 411; [0035]);

identifying a second cache line correlated with the first cache line based on how

frequent the second cache line is loaded subsequent to the first cache line (i.e., other

than most recently used; prefetch hits; e.g., [0026]) or [0022]); and

prefetching the second cache line to the cache (e.g., [0018]; [0026]).

Claim 79, Wong teaches a system comprising:

a processor including a cache to hold a first cache line (e.g., fig. 4, cache 407)

and including a correlation prefetcher to prefetch to the cache a second cache line

correlated with the first cache line (e.g., [0015]; [0035] based on how frequent the

second cache line is loaded subsequent to the first cache line (i.e., other than most

recently used; prefetch hits; e.g., [0026]) or [0022]); and

memory coupled to said processor (e.g., fig. 4, els. 413, 400).

Claims 44-47, 56, 57, 67, 68, Wong teaches the correlation prefetcher is to

identify the second cache line based on a link associated with the first cache line (i.e.,

miss address, set, time or reference or key-successor; e.g., [0017] [0019]-[0022]); the

cache is to hold the link in association with the first cache line (e.g., [0035]); the

correlation prefetcher is to identify a correlated cache line for multiple cache lines (e.g.,

[0026]); the correlation prefetcher is to generate a link identifying a correlated cache line

for multiple cache lines (e.g., [0026]); the cache is to hold a third cache line and wherein

the correlation prefetcher is to prefetch a fourth cache line based on how recent the

fourth cache line has been used if the correlation prefetcher is to not prefetch a cache

line correlated with the third cache line (e.g., [0026]; [0027]); the cache is to hold a third

cache line and wherein the correlation prefetcher is to prefetch a fourth cache line

based on how frequent the fourth cache line has been used if the correlation prefetcher

is to not prefetch a cache line correlated with the third cache line (i.e., other than most

recently used; prefetch hits; e.g., [0026]) or [0022]).

4.   The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set
> forth in section 102 of this title, if the differences between the subject matter sought to be patented and
> the prior art are such that the subject matter as a whole would have been obvious at the time the
> invention was made to a person having ordinary skill in the art to which said subject matter pertains.
> Patentability shall not be negatived by the manner in which the invention was made.

5.   Claims 40, 50-55, 62-66, and 76 are rejected under 35 U.S.C. 103(a) as being

unpatentable over Wong et al., US 2002/0078061 A1 (hereinafter Wong) as applied to

claims 39, 58, 73 above, and further in view of Dean et al. US 2002/0152361 (herein

after Dean).

Claims 40, 50-55, 62-66, and 76, Wong shows the claimed limitations as

discussed above. Wong does not explicitly show the second cache line from another

cache; the second cache line to replace the first cache line; a predictor to identify

whether the first cache line is to be replaced; the predictor is to identify whether the first

cache line is to be replaced based on instructions that used the first cache line during a

current residency in the cache; the predictor is to identify whether the first cache line is

to be replaced based on an age of the first cache line relative to an age value; the

predictor is to identify whether the first cache line is to be replaced based on an age of

the first cache line relative to that of other cache lines in the cache and relative to an

age value; the predictor is to identify whether the first cache line is to be replaced based

on whether the first cache line is likely to be used at an age beyond an age value. Dean

shows the second cache line from another cache (e.g., [0025]; the second cache line to

replace the first cache line (e.g., [0025]); a predictor to identify whether the first cache

line is to be replaced (e.g., [0025]; [0017]); the predictor is to identify whether the first

cache line is to be replaced based on instructions that used the first cache line during a

current residency in the cache (e.g., [0025]; [0017]); the predictor is to identify whether

the first cache line is to be replaced based on an age of the first cache line relative to an

age value (e.g., [0025]; [0017]); the predictor is to identify whether the first cache line is

to be replaced based on an age of the first cache line relative to that of other cache

lines in the cache and relative to an age value (e.g., [0025]; [0017]; [0032]); the

predictor is to identify whether the first cache line is to be replaced based on whether

the first cache line is likely to be used at an age beyond an age value (e.g., [0025];

[0017]; [0032]). It would have been obvious to one of ordinary skill in the art at the time

the invention was made to apply the teaching of Dean into the system of Wong because

it would improve cache hit rate and system performance.

6.   Claim 48 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wong et

al., US 2002/0078061 A1 (hereinafter Wong), in view of Witt US 6332187.

Claim 48, Wong shows the claimed limitations as discussed above and shows

the correlation prefetcher is to identify from one set of a cache a correlated cache line

for multiple cache lines in the one set (e.g., [0015]). Wong does not explicitly show a

set associative cache. Witt shows a set associative (e.g., col. 10, lines 20-30). It would

have been obvious to one of ordinary skill in the art at the time the invention was made

to apply the teaching of Witt into the system of Wong because it would reduce

complexity and increase speed of a cache in the system.

7.   Claims 43 and 61 are rejected under 35 U.S.C. 103(a) as being unpatentable

over Wong et al., US 2002/0078061 A1 (hereinafter Wong) as applied to claims 39, 58,

above, and further in view of Dean et al. US 2002/0152361 (herein after Dean) and Witt

US 6332187.

Claims 43 and 61, Wong shows the claimed limitations as discussed above and

teaches the first and second cache lines in a same set (e.g., [0015]). Wong does not

explicitly show the second cache line from another cache. Dean shows the second

cache line from another cache (e.g., [0025]). It would have been obvious to one of

ordinary skill in the art at the time the invention was made to apply the teaching of Dean

into the system of Wong because it would improve cache hit rate and system

performance. The combination of Wong and Dean does not explicitly show a set

associative cache. Witt shows a set associative (e.g., col. 10, lines 20-30). It would

have been obvious to one of ordinary skill in the art at the time the invention was made

to apply the teaching of Witt into the combined system of Wong and Dean because it would reduce complexity and increase speed of a cache in the system.

8.   Applicant's arguments filed 6/14/07 have been fully considered but they are not persuasive.

9.   In the remarks the applicant argued that Wong did not teach "wherein the correlation prefetcher is to identify the second cache line as being correlated with the first cache line based on an age of the second cache line relative to that of the first cache line" or "identifying a second cache line correlated with the first cache line based on an age of the second cache line relative to that of the first cache line" or "a correlation prefetcher to prefetch to the cache a second cache line correlated with the first cache line based on an age of the second cache line relative to that of the first cache line" with respected to claims 39, 58, and 73.

The examiner disagreed to the applicant argument because Wong teaches wherein the correlation prefetcher is to identify the second cache line as being correlated with the first cache line based on an age of the second cache line relative to that of the first cache line (i.e., time or reference; e.g., [0017], [0019]-[0022], [0026]); identifying a second cache line correlated with the first cache line based on an age of the second cache line relative to that of the first cache line (i.e., time or reference; e.g., [0017], [0019]-[0022], [0026]) (e.g., [0018]; [0026]); or prefetcher to prefetch to the cache a second cache line correlated with the first cache line (e.g., [0015]; [0035])

based on an age of the second cache line relative to that of the first cache line (i.e., time or reference; e.g., [0017], [0019]-[0022], [0026]) (e.g., [0018]; [0026]).

In particular, according to Wong, [0026] teaches prefetching based on age because Wong teaches the use of most recently used priority where in the most recently (new) or least recently (old) is the length of time during which a cache line has existed correlated to another cache line. Also, Wong, [0017], [0019]-[0022], teaches identifying a cache line as being correlated with a first cache line based on age or length of time (e.g., previous, present, time 5) during which a cache line has existed.

10.   The other of Applicant's arguments have been considered but are moot in view of the new ground(s) of rejection.

11.   Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

12.   Any inquiry concerning this communication or earlier communications from the examiner should be directed to Denise Tran whose telephone number is (571) 272-4189. The examiner can normally be reached on Monday and Thursday from 8:45 a.m. to 5:15 p.m.. The examiner can also be reached on alternate Friday

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Sanjiv Shah, can be reached on 571-272-4098. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Denise Tran

9/13/07